

# TC7WH157FU, TC7WH157FK

## 2-Channel Multiplexer

The TC7WH157 is an advanced high speed CMOS 2-Channel Multiplexer fabricated with silicon gate CMOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. It consists of 2-input digital multiplexer with common select and strobe inputs.

When the  $\overline{\text{STROBE}}$  input is held "H" level, selection of data is inhibited and all the outputs become "L" level.

The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

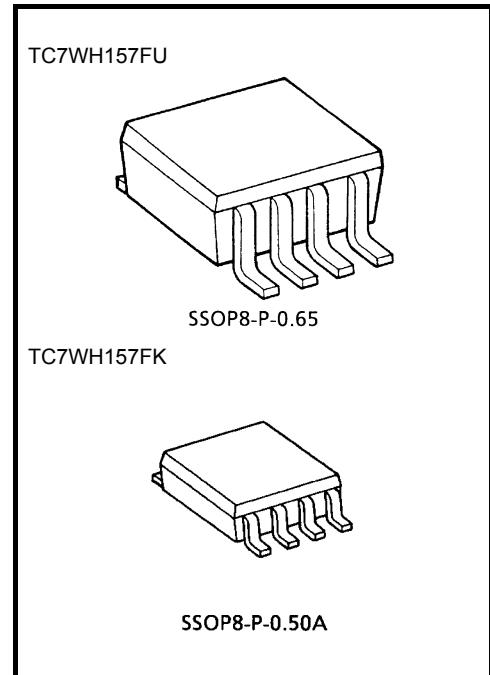
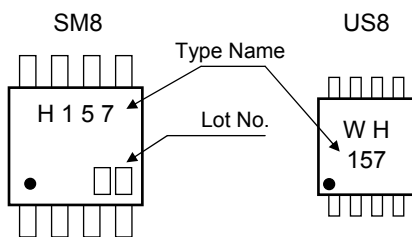
An input protection circuit ensures that 0 to 7 V can be applied to the input pins without regard to the supply voltage.

This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

### Features

- High speed:  $t_{pd} = 4.1 \text{ ns (typ.)}$  at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 2 \mu\text{A (max)}$  at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- 5.5-V Tolerant inputs.
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range:  $V_{CC} \text{ (opr)} = 2\sim 5.5 \text{ V}$
- Low Noise :  $V_{OLP} = 0.8 \text{ V (max.)}$

### Marking

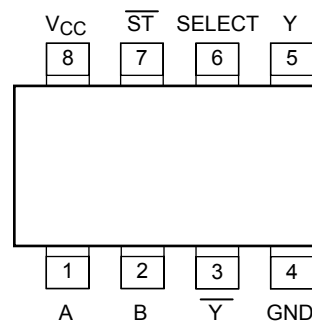


Weight

SSOP8-P-0.65: 0.02 g (typ.)

SSOP8-P-0.50A: 0.01 g (typ.)

### Pin Assignment (top view)



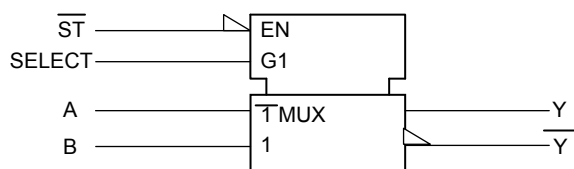
## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V <sub>CC</sub>	-0.5~7.0	V
DC input voltage	V <sub>IN</sub>	-0.5~7.0	V
DC output voltage	V <sub>OUT</sub>	-0.5~V <sub>CC</sub> + 0.5	V
Input diode current	I <sub>IK</sub>	-20	mA
Output diode current	I <sub>OK</sub>	±20	mA
DC output current	I <sub>OUT</sub>	±25	mA
DC V <sub>CC</sub> /ground current	I <sub>CC</sub>	±50	mA
Power dissipation	P <sub>D</sub>	300 (SM8)	mW
		200 (US8)	
Storage temperature	T <sub>stg</sub>	-65~150	°C
Lead temperature (10 s)	T <sub>L</sub>	260	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

## Logic Diagram



## Truth Table

INPUTS				OUTPUTS	
$\overline{ST}$	SELECT	A	B	Y	$\overline{Y}$
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

X : Don't Care

## Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	2.0~5.5	V
Input voltage	V <sub>IN</sub>	0~5.5	V
Output voltage	V <sub>OUT</sub>	0~V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	-40~85	°C
Input rise and fall time	dt/dv	0~100 (V <sub>CC</sub> = 3.3 ± 0.3 V)	ns/V
		0~20 (V <sub>CC</sub> = 5 ± 0.5 V)	

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		Unit	
				Min	Typ.	Max	Min	Max		
High-level input voltage	V <sub>IH</sub>	—	2.0	1.50	—	—	1.50	—	V	
			3.0~5.5	V <sub>CC</sub> × 0.7	—	—	V <sub>CC</sub> × 0.7	—		
Low-level input voltage	V <sub>IL</sub>	—	2.0	—	—	0.50	—	0.50	V	
			3.0~5.5	—	—	V <sub>CC</sub> × 0.3	—	V <sub>CC</sub> × 0.3		
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50 μA	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
			I <sub>OH</sub> = -4 mA	4.5	4.4	4.5	—	4.4	—	
				3.0	2.58	—	—	2.48	—	
I <sub>OH</sub> = -8 mA	4.5	3.94	—	—	3.80	—				
	—	—	—	—	—	—				
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I <sub>OL</sub> = 4 mA	3.0	—	—	0.36	—	0.44	
				4.5	—	—	0.36	—	0.44	
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND	0~5.5	—	—	±0.1	—	±1.0	μA	
			5.5	—	—	2.0	—	20.0	μA	

## AC Characteristics (Input: $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40~85°C		Unit		
			VCC (V)	CL (pF)	Min.	Typ.	Max.		Min.	Max.
Propagation Delay Time (A, B - Y)	$t_{pLH}$		3.3 ± 0.3	15	—	6.2	9.7	1.0	11.5	ns
				50	—	8.7	13.2	1.0	15.0	
	$t_{pHL}$		5.0 ± 0.5	15	—	4.1	6.4	1.0	7.5	
				50	—	5.6	8.4	1.0	9.5	
Propagation Delay Time (SELECT - Y)	$t_{pLH}$		3.3 ± 0.3	15	—	8.4	13.2	1.0	15.5	ns
				50	—	10.9	16.7	1.0	19.0	
	$t_{pHL}$		5.0 ± 0.5	15	—	5.3	8.1	1.0	9.5	
				50	—	6.8	10.1	1.0	11.5	
Propagation Delay Time ( $\overline{\text{ST}}$ - Y)	$t_{pLH}$		3.3 ± 0.3	15	—	8.7	13.6	1.0	16.0	ns
				50	—	11.2	17.1	1.0	19.5	
	$t_{pHL}$		5.0 ± 0.5	15	—	5.6	8.6	1.0	10.0	
				50	—	7.1	10.6	1.0	12.0	
Input Capacitance	$C_{IN}$			—	4	10	—	10	pF	
Power Dissipation Capacitance	$C_{PD}$	(Note 1)			—	20	—	—	—	pF

Note 1:  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

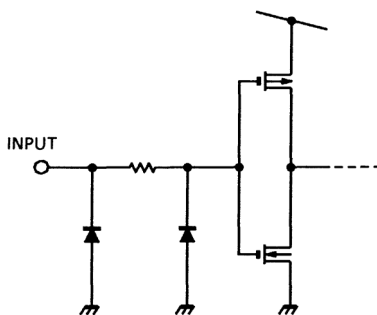
Average operating current can be obtained by the equation :

$$I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

## Noise Characteristics (Ta = 25°C, input: $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	VCC (V)	Typ.	Limit	Unit
Quiet output minimum dynamic $V_{OL}$	$V_{OLV}$	$C_L = 50 \text{ pF}$	5.0	-0.3	-0.8	V
Minimum high level dynamic input voltage	$V_{IHD}$	$C_L = 50 \text{ pF}$	5.0	—	3.5	V
Maximum low level dynamic input voltage	$V_{ILD}$	$C_L = 50 \text{ pF}$	5.0	—	1.5	V

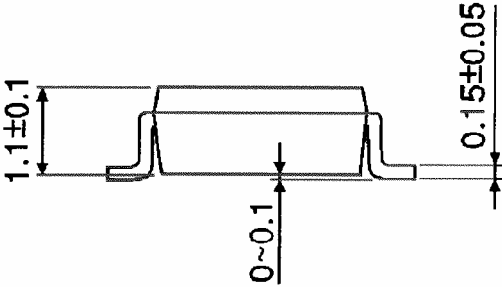
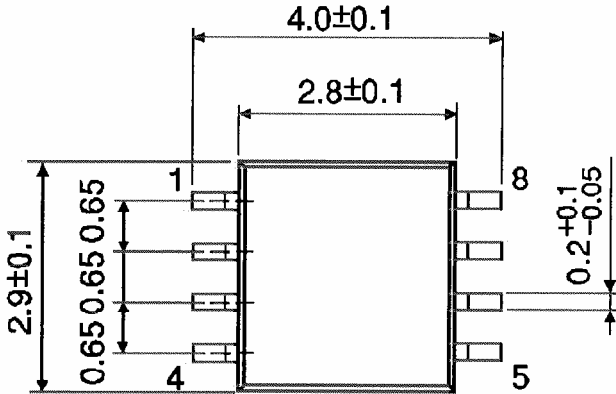
## Input Equivalent Circuit



**Package Dimensions**

SSOP8-P-0.65

Unit : mm

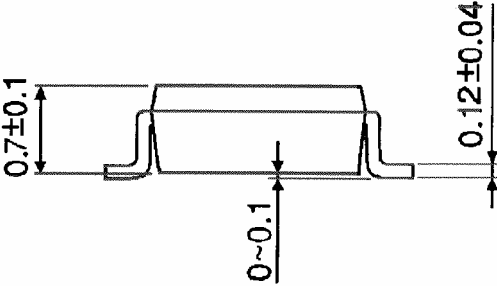
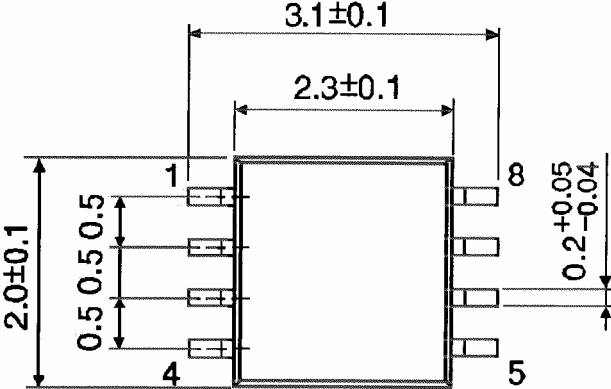


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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